SOIL SURVEY OF THE GAINESVILLE AREA, FLORIDA.

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LOCATION AND BOUNDARIES OF THE AREA.

The Gainesville area is located in the peninsula portion of Florida, about midway between the extremities of the State. The area is rectangular in shape and covers two maps of the United States Geological Survey, known as the Arredondo and Williston sheets, which were used as a base for the preparation of the soil map which accompanies this report. The limits of the area are the parallels 29° 15′ and 29° 45′ north latitude and the meridians 82° 15′ and 82° 30′ west longitude, including in both land and water surface

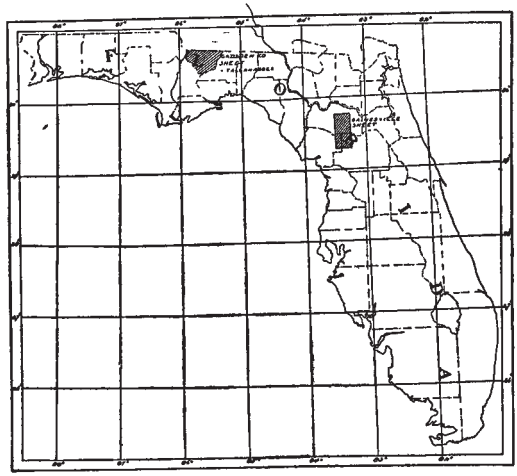

FIG. 10.—Sketch map showing location of the Gainesville area, Florida.

about 534 square miles, or of land alone 310,208 acres, or about 485 square miles. Parts of Levy, Marion, and Alachua counties lie within the area.

Gainesville, with a population of about 5,000, is the largest town. Micanopy is the center of a prosperous trucking and orange-growing community. The smaller lumbering towns of Williston, Montbrook, and Morriston lie within the limits of the survey.

HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

It was not until after the transfer of Florida to the United States that pioneers began to come into this area from the adjoining States. In 1825 the first house was built on the present site of Gainesville.

A few years later there were two white families located near the village of the friendly Indian chief Micanopy, from whom the town later took its name. The Indian wars broke out with great violence in 1835. The center of the trouble was about this village, and the white settlers, with few exceptions, were forced to leave the area. When the Indians were finally subdued and removed to their western reservations, the real agricultural history of the area may be said to have begun. A number of South Carolinians came to grow the long staple Sea Island cotton, which was a very profitable crop. Sugar cane was extensively grown by these planters for making both sirup and sugar, and tobacco, rice, sweet potatoes, and corn were also produced. In 1859 Judge Day, of Micanopy, started the first orange grove of this area by budding the sweet orange upon the wild sour stock, which had hitherto been considered worthless. The fruit at this early date met with a ready sale and the profits of the orange-growing industry caused its rapid expansion.

The prosperity of the State was interrupted in 1860 by the approaching outbreak of the civil war. In the end, however, the war resulted beneficially to the State from a material standpoint. Many of the soldiers, pleased by the climate or attracted by the resources of the region, returned to make it their home. Capital was brought in, railroads were rapidly extended, and a broad prosperity resulted.

The first industry to assume importance was the growing of Sea Island cotton, and for several years after the war large profits were made from this crop. Later the caterpillar proved a great pest, and in some localities the cultivation of cotton was abandoned. Attention was then turned to the orange groves, which were wonderfully productive and profitable, and as transportation facilities to the northern markets improved the growing of other fruits and vegetables was attempted. Before 1880 the trucking industry had begun to assume importance, and as early as 1883 nearly 100,000 crates of vegetables were shipped from the vicinity of Arredonda alone. After this time more attention was paid to oranges, and the greater number of the immigrants to the State came with the intention of starting groves. The soil and apparently the climate of this area were especially adapted to the production of citrus fruits, and the oranges of central Florida held a place in the market second only to the famous Indian River fruit.

The wildest speculation in Florida lands now ensued. The light, sandy land, which had been considered of but little value, sold for from $20 to $50 an acre, and the hammock lands for much more. About the year 1890 phosphate was discovered within the limits of this area, and the most exaggerated views were held of the extent and value of the deposits. The abnormal conditions and the inflated

land values brought about by these causes could not long endure, the boom collapsed, and agriculture became greatly depressed.

The return to normal conditions through natural causes was hastened by the great freeze of 1895. To those who had made orange growing their sole work the blow was disheartening. Many of the growers had spent the best years of their lives and their whole fortunes in bringing their groves into bearing. A large number of this class left the State; others went to the southern part of the State, where groves could be grown more safely. Those who remained branched out into other lines of agriculture and began to give more attention to general farming. Although competition with southern Florida has been a disadvantage with which the truck growers of this area have had to contend, vegetables have been grown extensively about Gainesville and Micanopy, and in most cases good profits have been realized. On the whole, it may be said that the farmers have been so successful that there now remains little visible effect of the freeze on the general prosperity of the farming population.

CLIMATE.

The following tables, taken from the records of the Weather Bureau stations at Gainesville, within the area; at Archer, on its western border, and Lake City, in an adjoining county on the north, show the normal monthly and annual temperature and precipitation, and the occurrence of the last frost in spring and the earliest in fall.

Normal monthly and annual temperature and precipitation.

Month.	Gainesville.		Archer.		Lake City.	
	Temperature.	Precipitation.	Temperature.	Precipitation.	Temperature.	Precipitation.
	° *F.*	*Inches.*	° *F.*	*Inches.*	° *F.*	*Inches.*
January	54.4	3.07	55.3	3.01	56.1	3.70
February	56.6	3.57	58.6	3.77	56.1	4.64
March	62.6	3.98	62.9	3.89	64.1	5.04
April	67.7	2.45	68.0	2.89	68.8	3.11
May	75.6	2.98	75.0	3.78	76.2	2.84
June	82.1	6.83	79.0	8.10	80.6	6.44
July	81.5	6.84	80.5	5.84	81.1	7.28
August	81.0	8.76	81.7	7.17	81.4	6.25
September	77.4	4.73	79.2	6.20	77.9	5.84
October	70.1	2.79	71.6	2.96	70.6	3.08
November	61.8	2.00	65.7	2.41	61.7	3.28
December	56.6	3.36	57.8	3.05	56.7	3.98
Year	68.9	51.36	69.6	53.07	69.3	55.48

Dates of first and last frosts.

Year.	Gainesville.		Archer.		Lake City.	
	Last in spring.	First in fall.	Last in spring.	First in fall.	Last in spring.	First in fall.
1897			Feb. 28	Dec. 29	Feb. 28	Dec. 28
1898	Feb. 2	Dec. 6	Feb. 23	Dec. 6	Feb. 23	Dec. 6
1899	Feb. 15	Dec. 30	Mar. 8	Dec. 5	Mar. 8	Dec. 3
1900	Feb. 19	None.	Feb. 26	Nov. 10	Feb. 26	Nov. 13
1901	Mar. 17	Nov. 17	Mar. 18	Nov. 16	Mar. 7	Nov. 16
1902	Feb. 19	Dec. 27	Mar. 19	Nov. 28	Feb. 25	Nov. 28
Average	Feb. 20	Dec. 13	Mar. 6	Dec. 1	Mar. 1	Dec. 1

It will be seen that on an average nearly nine months of the year are free from frost. The truck growing, however, is done almost entirely in the winter months, these being so mild that, though light frosts are of frequent occurrence, vegetables—such as lettuce, cabbage, pease, and beans—and strawberries mature in the open air. A light covering for vegetables on a frosty night is of great benefit, and insures a profit which might otherwise be lost by the checking of the growth of the crop. The rainfall is usually well distributed throughout the year, but the heaviest precipitation occurs in summer, when, during the rainy season, showers are of almost daily occurrence. Droughts may occur in the winter when rain is most needed by the truck; therefore the careful truck grower finds it good policy to have an irrigating plant to operate in case of need. These plants are of the simplest construction, and are inexpensive, as the plots to be watered are small. With these simple safeguards against climatic extremes, the truck grower can calculate the results of his labor as closely in Florida as in other agricultural communities where crops are grown in season.

The peninsula of Florida owes its prosperity in large measure to its mild and agreeable climate. The soils are not of a character to encourage a system of general farming in competition with more favored localities, but a mild, semitropical climate has combined with the sandy soils to build up a great trucking industry. In addition, the material prosperity of the State has been enhanced by the thousands of visitors that flock thither each winter to regain their health or to escape the severity of the northern winters.

Since the destruction of the orange groves in this part of the State by the severe freeze of 1895, only the groves in the lake region about Micanopy have been brought back into bearing. In this connection it is interesting to note the severe freezes that have occurred in Florida within historic times.

The first very cold weather of which we have any authentic account was in 1766, when all the tropical fruits in the country except

the orange trees were destroyed. Very cold days occurred in 1774, 1799, and 1828, but only in 1835 was there a freeze to compare in destructiveness with that of 1895. The freeze of 1835 lasted ten days, and was very severe for about three days. The mercury in some parts of the State reached 7° F. The orange groves, both wild and cultivated, were killed as far south as the twenty-eighth parallel of latitude, and many of the trees never started again, even from the roots. In 1885 a cold wave killed the young trees and did considerable damage to the bearing groves.

The temperature did not fall as low in the freeze of 1895 as in some which preceded it, but the destruction of the groves was the result of two cold waves coming in succession, and of the impaired condition of the trees at the time of the latter. The first cold wave occurred on the night of December 29, 1894, when the mercury in this area descended to about 18° F. Some damage was done to the groves, but the trees were then dormant, and a new growth was soon put forth. While in this condition, on the night of February 7, 1895, the trees were subjected to a second cold wave, in which the mercury stood at 16° F., and all citrus fruit trees were killed to the ground. Sprouts started from nearly all the stumps, and there was a general disposition on the part of the growers to restore their groves from these shoots, but the cold winters which followed killed back this young growth and effectually discouraged the industry in the greater part of the area. The growers about Micanopy who persevered in their attempts now have their groves in bearing.

While oranges will always be grown, and large profits may yet be realized by those who have restored their groves, the development of the industry on a large scale in this area will always be hampered by the possibility of a freeze, although only two killing freezes have been recorded since 1766. It is generally considered advisable, however, for those who can do so without too great expense to restore their groves, as the profits are well worth the risk.

PHYSIOGRAPHY AND GEOLOGY.

A number of interesting physiographic features are represented in the Gainesville area. Properly to understand the topography of the region, which the soils follow to some extent, it is necessary to know something of the geological history.

The land surface of the peninsula of Florida, as it stands to-day, owes its position to successive upheavals and depressions and to the accumulations of beds of limestone, sand, and clay during the period of submergence below the sea. The primary uplift was in Eocene times, and the deposits that make up the backbone of the central part of the State are of Vicksburg age. These are limestones, containing

the disklike fossil remains of the *Orbitoides mantelli*, which may be found a short distance below the surface in any part of the area. Later formations were deposited over this Vicksburg limestone, and during the last submergence to which the region was subjected a heavy stratum of sand was laid down over the entire peninsula. The breaking up of the land surface into its present condition has been brought about by the removal of this mantle of sand by stream action and by the dissolution of the limestone bed by the chemical and mechanical action of subterranean waters. These agencies have resulted in an eroded region, ranging in height from 50 to 200 feet above sea level, in which are sharply cut valleys and a few areas of plateaulike appearance, where the original sand cap has not undergone much change. In the eroded areas the soils vary as the limestone is approached, and in some places in proportion as the limestone itself has weathered. Along a line extending across the area from north of Bennington toward Ocala is an outcrop of shell flint, a corniferous limestone of such hardness that it has resisted the agencies of weathering. In some localities near this outcrop the unweathered rock directly underlies the sandy top soil; in most places, however, there is a calcareous clay stratum overlying the rock. The prevailing type of limestone is rapidly yielding to the solvent power of the underground waters, as is evident from the many sink holes throughout the area, where the earth has caved in to fill a subterranean cavity. Considerable streams disappear into some of these sinks, and a number of caverns formed by the streams are found in this region. Lakes and ponds, also formed by the lowering of the land surface through these agencies, are scattered over a large part of the area. South of Gainesville, in what is known as the Lake Region, the bodies of water are larger and more abundant. Some of these lakes are considerably lower than the surrounding country, and their slopes are steep and well eroded. In this region the weathering of the exposed limestone has produced the so-called "heavy hammock" soils.

The partly eroded areas from Fairbanks westward and southward to the Lake Region have a sand covering of from 3 to 20 or more feet in depth, and here is developed the typical Norfolk sand.

The largest of the comparatively uneroded areas is found north of Gainesville. There are smaller detached areas around Micanopy and Wacahoota. The country is almost level and ranges in height from 160 to 200 feet above sea level. A few small streams carry the surface water from these tracts, but no general stream systems have been established and the drainage is very poor.

The numerous areas designated on the map as lakes or prairies are very shallow depressions, partly filled with water, which varies in depth in dry and wet seasons. The water, 3 feet or less in depth, is

filled with a mass of coarse water grasses, water lilies, and other aquatic plants. This vegetation furnishes pasture for large herds of cattle when the pasture on the uplands has given out.

The largest of these is Alachua Lake or Payne Prairie, a few miles south of Gainesville. When first known to the early settlers this area was a dry prairie, used as a grazing ground for the cattle of the Indians. Later a sink near its eastern border, which received the waters of a small creek, became clogged and the prairie was overflowed, creating a lake 8 miles long and 4 miles wide.

These water-covered prairies have no agricultural value except as pasture. The bottoms are made up of white sand washed in from the higher lying lands. There is little present possibility of draining these areas profitably.

SOILS.

The soils of the Gainesville area have been classified into six types. There is not a wide range in texture between the surface soils of the several types, and the classification depends on the depth and character of the subsoil and the crop-producing power of the soil. The latter property is strikingly exhibited in the variety of the forest trees which the soils support. The reason for the difference in timber growth has not been determined. It is not clear why the Norfolk sandy loam should not produce the heavy hardwood growth of the Portsmouth sandy loam areas instead of longleaf pine alone; or why certain sandy hammocks should support this heavy growth while the Norfolk sand grows only pine and scrub oak. It is known, however, that soils which support the hammock growth are underlain by clay at a depth of less than 5 feet, but such clay subsoils do not always produce the hardwood timber growth.

The names of the soil types of the Gainesville area, with their respective areas, are given below.

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Norfolk sand	139,328	44.9	Gainesville sand	7,744	2.5
Norfolk sandy loam	86,784	28.0	Muck	128	.1
Portsmouth sandy loam	40,384	13.0	Total	310,208	
Portsmouth fine sand	35,840	11.5			

NORFOLK SAND.

The top soil of the Norfolk sand is usually a gray or brown sand of very fine to medium texture, containing a small percentage of organic matter, to which it owes its darker color. It ranges in depth

from 5 to 8 inches. The subsoil is a yellow or white sand of similar texture, extending to a depth of more than 3 feet. The Norfolk sand is loose and incoherent, the subsoil being more so than the soil, as it lacks the binding effect of the organic matter found nearer the surface.

The Norfolk sand is the most extensive soil type found in the Gainesville area. The largest area of the type is a strip having a northeast and southwest direction, and including the towns of Fairbanks, Gainesville, and Archer. It is followed in a general way by the Seaboard Air Line Railroad. Another area occupies the southwestern corner of the survey, includes the town of Morriston, and stretches along the southern border of the area as far as Blitchton. Besides these extensive developments, there are numerous irregular patches of the Norfolk sand included by other types. In these spots the soil sometimes has a clay subsoil below 3 feet, but the depth of the sand and its crop-producing value justify its classification with the Norfolk sand. There are other parts of this soil where the sand is finer than in the typical profile, but these areas were not sufficiently important to warrant the establishing of another type.

The elevation of the Norfolk sand areas varies in different parts of the area from 50 to 200 feet above sea level. The country is everywhere rolling and in some parts almost hilly. The inequalities of the surface are increased by the sink holes, where the earth has subsided into some cavity hollowed into the underlying limestone. These sinks receive the local drainage, and in some cases have become the centers of extensive drainage systems.

The drainage of the Norfolk sand is good, and the water supply for the use of growing crops is well regulated. The power of this soil to retain a uniform water supply is remarkable. The soil is always moist immediately beneath the surface, even after prolonged droughts, and crops seldom suffer for lack of water. Another valuable feature is that the soil moisture is readily delivered to the growing crop, so that plants which would perish with the same moisture content in almost any other soil may flourish on this soil. The Norfolk sand maintains about 4 per cent of water,[a] and this seems to be ample to meet the needs of the truck crops, while 6 per cent makes the soil quite wet. Just what property of this soil enables it to maintain so uniform a moisture content has not yet been ascertained.

The Norfolk sand is the type of soil so generally utilized along the Atlantic seaboard for growing such crops as have to be forced to an early maturity to meet the demands of a winter market. The excellent drainage and warmth of this soil, together with its ready response to the stimulating effect of commercial fertilizers, make it admirably

[a] Bulletin No. 13 of the Division of Soils.

adapted to this system of intensive farming. The soil, however, while very productive under favorable conditions, requires heavy applications of commercial fertilizers to secure the best results with the forced crops. For this reason the Norfolk sand has of late years been neglected in favor of the more productive hammock soils, with their larger content of organic matter. This is especially the case in the production of cabbage and lettuce, which thrive on those lands. Watermelons and cantaloupes grow to perfection on the Norfolk sand. Strawberries, beans, pease, and potatoes are still grown to some extent. The citrus fruits also do well, but since the freeze of 1895 and the succeeding cold winters the groves have with few exceptions been entirely neglected.

By far the greater part of the Norfolk sand is covered by forests of longleaf pine, with a characteristic growth of scrub oak on many of the knolls and ridges. The coarse grasses which grow on these pine lands furnish a fair pasturage for cattle during the spring and early summer. The more progressive cattle raisers are trying to provide winter pasture by growing forage crops. The best plant for this purpose so far found is the velvet bean. Wherever the land has been cultivated a thick growth of crab grass covers the ground. This is sometimes cut for hay, and the practice should become more general.

Cotton and corn are generally grown on the Norfolk sand. The yields are light, but the expense of cultivating these crops is not great.

The following analyses of typical samples of the Norfolk sand show the texture of the soil and subsoil:

Mechanical analyses of Norfolk sand.

No.	Locality.	Description.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
10607	1 mile S. of Micanopy.	Coarse to medium sand, 0 to 8 inches.	1.0	11.7	28.9	44.0	9.0	2.7	2.4
10609	1½ miles SE. of Gainesville.	Coarse to medium sand, 0 to 6 inches.	.7	11.8	28.8	44.6	9.0	1.9	2.8
10610	Subsoil of 10609	Coarse to medium sand, 6 to 36 inches.	.5	10.1	25.7	47.7	10.8	1.7	2.7
10608	Subsoil of 10607	Medium to coarse sand, 8 to 36 inches.	.9	11.5	28.6	43.8	9.7	2.4	3.9

NORFOLK SANDY LOAM.

The Norfolk sandy loam is a medium to coarse sand having an average depth of 18 inches. In texture it does not differ from the Norfolk sand, except that in some localities, where the top soil is not deep, there is a slight loaminess of texture. There is also usually present more organic matter than in the soil of the Norfolk sand, which adds to the loamy character of the surface soil. The subsoil is a sandy clay which passes quickly into a heavy, stiff drab clay, mottled with iron and containing iron crusts. There may also be present fragments of partially weathered limestone. Nearly everywhere the hard unweathered limestone is found at a depth of from 3 to 4 feet, but rarely without the overlying stratum of clay derived from it.

The Norfolk sandy loam occupies a large, irregular area, stretching from a few miles north of Archer, where it enters the Gainesville area, southeastward toward Ocala. It merges into the hammock lands on the east and into the Norfolk sand area about Morriston on the south. There are also small detached areas south of Micanopy.

The topography occupied by the Norfolk sandy loam is that of a gently rolling upland. There are no abrupt changes of elevation, although the type may occur at almost any height above sea level.

The drainage of the soil is very good, as the slope of the land is sufficient to remove the excess of water that might otherwise be retarded by the clay subsoil. The moisture is well retained, and crops seldom suffer even in periods of protracted drought.

On the Norfolk sandy loam may be seen the best system of farming practiced in the Gainesville area. Here the farmers are producing their home supplies and making the more speculative money crop a matter of secondary importance. This system is best adhered to in the vicinity of Williston, and the good results are evidenced by the appearance of the farms and the contentment of the farming class. Before 1895 the orange groves took the time and attention of the farmer, and in many cases were his sole dependence for an income. Since the destruction of the groves more attention has been given to the general farm crops, and corn, potatoes, fruits, and vegetables for home needs have been grown. The greatest advancement, however, has been made in the production of pork for home or local consumption. Peanuts are grown to fatten the hogs, and farmers who are in a position to know assert that meat can be produced in this way more cheaply than in the West, where 25 bushels of corn are grown per acre. The principal money crop in the vicinity of Williston is cucumbers. For several years the farmers have made a specialty of this crop, to which the Norfolk sandy loam seems especially well adapted, and large average returns have been secured. It must be kept in mind that this profit is almost clear, as it is made after the home needs have been

supplied from the farm. As a result of this system of agriculture, there are few farmers that are not in better circumstances than before the loss of the groves.

The greater part of the Norfolk sandy loam is uncleared. The timber growth consists entirely of longleaf pine, usually thickly set and with no undergrowth. In the spring and early summer fair pasturage is found for the cattle in the native grasses of these uplands. In the winter this pasture is almost worthless, and if the grass be killed by early frost the cattle are reduced to the point of starvation. A very small quantity of feed would suffice to carry the cattle through the winter, and it is surprising that more attention is not given to the subject of forage crops.

Mechanical analyses of the Norfolk sandy loam are given in the following table:

Mechanical analyses of Norfolk sandy loam.

No.	Locality.	Description.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
10619	1 mile NW. of Flemington.	Gray sand, 0 to 18 inches	0.4	8.0	24.4	43.8	15.9	3.2	3.9
10623	¼ mile S. of Elmwood.	Loose sand, 0 to 10 inches	.2	3.0	10.7	57.2	21.5	3.4	3.9
10624	Subsoil of 10623	Brown sandy clay, 10 to 36 inches.	.1	2.6	7.8	41.5	15.2	11.9	20.1
10620	Subsoil of 10619	Gray, stiff sandy clay, 18 to 36 inches.	1.0	5.6	12.5	22.8	8.0	20.6	29.5

PORTSMOUTH FINE SAND.

The Portsmouth fine sand has been mapped as a distinct soil type on account of its physiographic and drainage features and their effect on the crop-producing power and consequent commercial value of the land rather than from any marked difference in texture between it and the Norfolk sand. The type is locally known as the "flat woods" or "scrub land." The soil is a fine to medium sand, and is usually dark-gray or black from the presence of organic matter. Where this organic matter is not present the sand is bleached and white on the surface. The depth of the top soil is usually about 16 inches. The subsoil, wherever the usual undrained conditions prevail, is a chocolate-brown sand, similar in texture to the soil. The distinctive color is given the subsoil by finely divided ferruginous material. It acts as a cementing agent and gives to the soil a loamy texture, and in some places forms a soft iron crust. This material decreases in compactness with depth, and below 3 feet the sand is

pure white, and, when wet, quickly flows in and fills any hole sunk below this depth. For this reason it is locally known as "quicksand."

The largest area of the Portsmouth fine sand is found north of Gainesville, extending from that place to the northern limit of the survey. There are also smaller areas near Micanopy and Wacahoota, in which the characteristics of the type are well developed.

The Portsmouth fine sand is sedimentary in origin, and occupies the comparatively level and little-eroded stretches of plateaulike appearance which represent the original land surface of the region when it was last elevated above sea level. The most extensive area of this type occupies the most elevated portion of the area surveyed, ranging from 160 to 200 feet above sea level. The smaller areas do not attain this elevation, but in no case is the type found below the level of the country immediately surrounding.

Notwithstanding the elevation of the Portsmouth fine sand, it is the most poorly drained soil of the area. The soil itself seems to be impervious in a high degree, and the streams have not eroded tributary channels sufficient to carry off the excess of water, which stands at an average depth of 2 feet below the surface at all times, and which, after heavy rains, stands on the surface for days at a time.

The vegetation on these pine flats is characteristic. There is an irregular forest growth of longleaf pine, with a low undergrowth of saw palmetto, gallberry bushes, and, in some places, scrub oak.

With the prevailing cheapness of land there is no probability that any considerable extent of the Portsmouth fine sand will be drained and brought under cultivation. No effort is now made to cultivate it on any scale worthy of notice. Near Micanopy, where edges of the areas of this type have been drained and included in truck fields, yields are obtained similar to those from the Norfolk sand.

The following table shows mechanical analyses of samples of the Portsmouth fine sand:

Mechanical analyses of Portsmouth fine sand.

No.	Locality.	Description.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
10627	1 mile E. of Rutledge.	Black loamy fine sand, 0 to 8 inches.	0.2	2.6	8.7	64.3	10.5	5.9	7.5
10625	¼ mile W. of Rutledge.	Black loamy fine sand, 0 to 6 inches.	.5	3.1	9.5	63.5	5.6	6.7	11.1
10628	Subsoil of 10627	Brown loamy fine sand, 8 to 36 inches.	.2	2.5	8.7	64.7	11.4	4.9	7.5
10626	Subsoil of 10625	Brown loamy fine sand, 6 to 36 inches.	.3	3.4	9.6	64.8	6.2	4.5	11.2

PORTSMOUTH SANDY LOAM.

The term Portsmouth sandy loam is applied to a soil having a considerable range in texture, but a fairly uniform crop value. The different phases of the type have a characteristic timber growth, and are included by the local name "hammock lands." The various grades of hammock lands are locally known as the "high hammock," the "low hammock," the "light hammock," the "heavy hammock," the "heavy clay hammock," and the "marl hammock," so called by reason of the topography, the timber growth, or the character and depth of the soil and subsoil materials. The usual surface material of the Portsmouth sandy loam is a sand of medium texture, of a mellow, loamy character, and nearly everywhere containing fragments of limestone. The soil of the virgin and recently cleared portions of the type is black with organic matter, accumulated from the decay of the dense vegetation which it has supported. The depth of this sandy top soil varies from a few inches in the heavy clay hammock to 5 feet in some portions of the very light hammocks. The average depth may be placed at 25 inches. The subsoil is a stiff, calcareous, drab clay, which passes into the limestone from which it was derived at varying depths. The small areas of a phase of this type, in which the clay comes to within a few inches of the surface, are known as "heavy clay hammock." It occurs in small patches around Rockypoint and in the dense forests south of Wacahoota, but in no case was an outcrop of this material found large enough to map as a separate type.

The largest development of the Portsmouth sandy loam occurs around Payne Prairie or Alachua Lake, and extends south and east into the Lake Region. Many smaller areas are found near the lakes and water courses—the usual position of the type throughout the area.

The Portsmouth sandy loam is everywhere marked by a natural growth of hardwood trees, consisting of a mixture of white oak, live-oak, water oak, hickory, magnolia, dogwood, and an occasional cabbage palmetto. These, with an undergrowth of saw palmetto, vines, and briars, form, in some places, an almost impenetrable jungle. The pine is rarely seen in this growth, and the cypress only in the most depressed, swampy localities.

Notwithstanding the natural facilities for drainage afforded this soil by its topography, there is much complaint by the truck growers that in wet seasons the drainage is inadequate. The heavy clay subsoil in many places seems to confine the water about the roots of the growing plants, with disastrous results. Drainage by surface ditches is resorted to, but considerable judgment is required to place the drains properly, and in many cases it can only be done by experiment.

Underdrainage by tiles would no doubt be more effective and more easily accomplished.

The water content of the hammock soils is on an average about twice that of the Norfolk sand, but there is no such uniformity in the supply throughout the year. Evaporation takes place from these soils very rapidly, and they can not maintain their water supply through long droughts. For this reason the valuable grasses which flourish during seasons of ample rainfall do not survive the droughts, and the heavier phases of this type are not so well adapted to stock raising as they would seem to be from their texture.

The Portsmouth sandy loam is, however, the strongest and most productive soil of the area, and for the purposes for which it is utilized it is probably the most valuable land in the State. The crops most generally grown, to which the soil seems best adapted, are lettuce, cabbage, pease, beans, and cantaloupes. This is the only soil on which the production of citrus fruits has been attempted since the great freeze. Near Micanopy oranges and grape fruit are grown with profit. There is no attempt to protect the trees from cold by covering or by building fires in the groves. In the case of guavas, mangoes, and lemons, the trees are covered during cold weather.

The following analyses show the texture of samples of the Portsmouth sandy loam:

Mechanical analyses of Portsmouth sandy loam.

No.	Locality.	Description.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
10613	1 mile NW. of Rockypoint.	Coarse to medium sand, 0 to 25 inches.	0.5	8.1	20.9	44.7	16.9	5.6	3.1
10615	2½ miles SE. of Johnson Pond.	Black sandy loam, 0 to 8 inches.	.6	4.6	13.7	50.0	15.5	11.3	4.0
10611	½ mile W. of Rockypoint.	Gray loamy sand, 0 to 28 inches.	.3	6.0	18.6	46.1	18.4	6.2	4.2
10616	Subsoil of 10615	Stiff heavy clay, 8 to 36 inches.	.7	2.3	4.0	20.9	18.7	36.0	17.1
10612	Subsoil of 10611	Gray loamy clay, 28 to 36 inches.	.6	5.4	13.4	34.4	14.5	9.1	22.6
10614	Subsoil of 10613	Gray heavy clay, 25 to 36 inches.	.4	8.8	18.8	34.7	8.0	2.6	26.7

The following sample contained more than one-half per cent of calcium carbonate ($CaCO_3$): 10616, 1.86 per cent.

GAINESVILLE SAND.

The Gainesville sand is a gray loamy sand 8 inches deep, containing much organic matter, underlain by a brown loamy sand of looser structure. The subsoil varies in depth, but usually at less than 3 feet it is underlain by a calcareous clay or by partly weathered limestone. Both soil and subsoil, as a rule, contain limestone fragments at all depths, and these, with the weathered products, give the soil the loamy characteristics which distinguish it from the other sandy soils of the area. Its color is also distinctive, being darker than the Norfolk sand, but not so dark as the Portsmouth fine sand. It is mellow and easily tilled, and tenant labor can be profitably employed in its cultivation.

The most extensive development of the Gainesville sand occurs in the northwestern part of the survey, and the characteristics of the type may best be seen near Bennington. There are other small areas of this soil, many patches of it about Gainesville being too small to indicate on the map. In some places the term "chocolate hammock" is applied to these spots, but the term is not restricted to this type of soil.

The Gainesville sand occupies the high, rolling upland, similar in appearance to that covered by the Norfolk sand. The soil is well drained and crops rarely suffer in seasons of excessive rainfall. While moisture is fairly well retained, the Gainesville sand does not withstand drought so effectively as the Norfolk sand.

A larger proportion of the Gainesville sand is under cultivation than of any other soil in the area, but more than half of it is yet uncleared. The characteristic timber growth is a mixed forest of pine and hardwood. The pines are large and rather scattering, and the interspersed growth consists of hickory and several varieties of oak. The magnolia is rarely seen on this type of soil. This soil, on account of its timber growth, is called, locally, "second hammock."

The principal and most profitable crop at the present time is the long staple or Sea Island cotton. The soil produces a very fine grade of this cotton, but seed for planting is imported from the sea islands to prevent any deterioration of the product. The planters who came to the State to grow cotton before the civil war, or shortly after, selected this type of soil. They farmed well and their descendants follow the same practices, so that to-day we find a thrifty class of farmers on this type of soil. Besides growing cotton, they produce the general farm crops and raise cattle and hogs. Corn, oats, and peanuts are the crops most successfully grown.

The following table shows the texture of typical samples of the Gainesville sand:

Mechanical analyses of Gainesville sand.

No.	Locality.	Description.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
10597	1 mile NW. of Paradise.	Gray medium sand, 0 to 20 inches.	0.4	10.4	23.1	49.8	12.5	2.4	1.1
10599	½ mile SW. of Micanopy.	Coarse to medium sand, 0 to 12 inches.	2.8	14.6	29.5	39.5	9.7	2.3	1.1
10595	2½ miles E. of Wacahoota.	Medium to coarse sand, 0 to 10 inches.	.4	9.7	23.4	46.9	14.5	3.3	1.6
10596	Subsoil of 10595..	Brown sand, 10 to 36 inches.	.6	8.6	24.9	45.6	14.0	3.2	2.2
10598	Subsoil of 10597..	Brown medium sand, 20 to 36 inches.	.8	10.3	22.5	46.8	13.1	2.5	3.7
10600	Subsoil of 10599..	Coarse to medium sand, 12 to 36 inches.	2.1	14.5	28.9	38.3	9.4	1.7	4.8

MUCK.

In the so-called "hammocks" there are depressed areas that have been filled in by accumulations of vegetable mold to a depth of from 1 foot to 3 feet. These Muck areas are unimportant, of only a few acres in extent, and only one has been indicated on the soil map. This lies about 5 miles southeast of Gainesville, on the shores of Newnans Lake. It has not been brought under cultivation. Celery was once grown on a small area of Muck near Gainesville, with fair success. The soil should be well adapted to this crop.

AGRICULTURAL METHODS.

Since the destruction of the orange groves by the severe freeze of 1895 the farmers of this area have turned their attention largely to the growing of vegetables. The soils are well adapted to truck crops, respond readily to careful management, and give profitable returns. Success or failure depends upon the stability of the northern markets, to which the vegetables are shipped, and upon the methods of culture followed in the field.

Lettuce, cabbage, cucumbers, peas, beans, eggplant, melons, tomatoes, and potatoes are successfully grown. The cultural methods are similar to those in vogue in other winter vegetable growing districts. Owing to the frosts, which often do considerable damage to unprotected plants, a method for covering the growing crop during the night is now in use among the more well-to-do farmers. Lettuce,

especially, is protected in this way, since it is earlier than the other crops, and therefore in more danger from frost. Large frames, from 18 to 20 feet wide, 2 feet high at the sides, 4 feet high in the center, and of any convenient length, are erected in the field. Over each frame a light canvas is spread. This completely covers, but does not touch, the plants. The lettuce plants, which are started in smaller frames, are transplanted to the larger ones from November 1 to January 1. They are set in rows, from 14 to 18 inches apart each way, and cultivated with hoe and rake. Every night, or when a frost is expected, the canvas is drawn down and is not raised until two or three hours after sunrise. The lettuce grown is head lettuce. Under favorable conditions it will be ready for the first cutting in from twelve to fourteen weeks. Only heads which have reached the proper degree of firmness are cut. These are packed in baskets which hold from 35 to 50 heads, and are then ready for shipment. After the lettuce has been removed, cucumbers are often planted in the frames. The other vegetables are not grown in the frames, for danger of frost is past at planting time. While lettuce and cucumbers will grow and thrive without this protection and often yield large returns, the conditions can be much better controlled by using the frames, and their use is considered advisable.

Small quantities of oats and corn are grown, but the yields are very low and the supply is not equal to the local demand. The hay grown is the native beggar weed and crab grass, but this supply is also deficient. Considerable cotton (Sea Island) is also grown. The methods of culture do not differ from those in vogue throughout the South. The yields are low, but the price is high enough to make the crop a profitable one. The price of this cotton does not fluctuate with the price of the short-staple cotton.

Owing to the forcing of winter crops on the sandy soils of the area commercial fertilizers are extensively used. The fertilizer companies put out special brands for the different crops; thus they have a lettuce, a cucumber, and a cotton "special." Many farmers buy the ingredients and mix them to suit the needs of their own fields. Stable manure is used when it can be obtained, but as little stock is housed and fed the supply is limited. The owners of livery stables in the towns sell what they produce for $2.50 a load.

While different crops are grown on the same soils, no systematic crop rotation is practiced. The vegetable grower often shifts from one piece of ground to another when the location is not suitable or the yield unsatisfactory. This can easily be done, since land is abundant and cheap.

On account of the irregularity and uncertainty of the rainfall during the winter and spring months irrigation is sometimes practiced

by the vegetable growers. Small pumping plants are installed on the shore of a stream or lake and pipes laid, usually above ground, to the field to be irrigated. When lettuce is grown laterals are run to different parts of the field and between the frames, if this system is used. The water is applied in a spray from small branch pipes which stand erect. If other crops are grown the water is allowed to reach the plants by running between the rows. This system of irrigation has proven very successful.

AGRICULTURAL CONDITIONS.

The farming classes of the area surveyed are in a fairly prosperous condition. Many of those who own farms near Gainesville or Micanopy live in town and thus have many advantages of which their more distant neighbors are deprived. They drive to the farm each day and superintend the different farm operations. Their homes are substantially built, painted, and kept in good repair. This is the smaller and more well-to-do class. The buildings of those throughout the country districts are not as well constructed, are often unpainted, and in poor repair. This state of affairs, however, is scarcely a fair indication of the financial condition of the owners, since the climate is very mild for nearly the entire year. The expenditure of money for substantial buildings seems to be considered unnecessary.

The greater number of the farms of the area are worked by the owners. When renting is practiced it is done on shares. When the owner of the farm furnishes one-half the fertilizer, half the stock, and half the implements, the returns are equally divided. When the tenant furnishes everything he usually gets two-thirds or sometimes three-fourths of the returns. Comparatively few of the farms are incumbered, and this is considered an indication of prosperity. In the growing of vegetables more or less speculation is always involved, and on account of a season of low prices or poor management the farmer is frequently obliged to borrow money with which to begin another crop.

The tracts of land vary in size from 2 to 2,000 acres or more. The larger areas are covered with the native forest, or, having been stripped of the timber, are now left desolate and undeveloped. Where vegetables alone are grown, and the system is intensive, the farms range from 2 to 10 acres. Where general farming is practiced, and the system is extensive, the farms run from 30 to 100 acres. The average size of all the farms under cultivation is estimated at 40 acres.

The question of labor is an important one, and the farmer is often handicapped in not being able to secure competent help when most needed. Approximately half the population of the area is colored.

The average wage by the day is 75 cents. Italian labor has been successfully introduced into some of the phosphate mines, but as yet this has not been tried by the farmers.

Considerable stock is raised in the area surveyed, though little attention is paid to proper feeding, selecting, or breeding. The cattle are allowed to run on the range and care for themselves during the entire year. In a few cases they are fed during the winter, but not enough to keep them in good condition. Through the spring and summer, a season of about six months, an abundance of nutritious pasture is furnished by the native grasses of the pine woods, crab grass, beggar weed, and some bermuda grass. During this time the cattle thrive and lay on flesh rapidly. In the fall the grasses die down and the stock is scarcely able to hold its own. In the winter, when the pasture is scant and it is necessary for the stock to travel long distances to secure enough to sustain life, the struggle for existence becomes a difficult one. The stockman counts on losing 15 or 20 per cent of his herd each winter, and in severe winters a loss of 25 per cent has been reported. The greater part of these actually starve to death. If kept in good condition the stock could easily withstand the elements, but when greatly emaciated their weak constitutions suffer from the exposure and become more subject to the ravages of disease. Those which survive the long fast and succeed in withstanding the winter exposure are mere skeletons. Although they lay on flesh rapidly when the fresh pastures appear, and seem to regain their vigor, no animal can be subjected to a prolonged period of starvation and exposure without having its vitality greatly impaired. The cattle are sold when they are four or five years old, and then weigh from 600 to 800 pounds each. They are usually sold in the fall, after a full season on good pasture. The local butchers buy a few for home consumption, but most of them are shipped farther north to feeders, who fit the stock for market. The prices obtained are low, usually from 2 to 3 cents a pound.

The condition which this state of affairs presents is a serious one. The most important problem which the stockman has to consider is the question of winter pastures and forage crops. The necessity for carrying the stock through the winter without a serious loss by death and by shrinkage in weight can not well be overestimated. The Bureau of Plant Industry and the experiment stations of the South are giving the question careful study, and the results of their work will be of great value to the stockmen of this area.

None of the grasses now grown in the area furnishes sufficient pasture for the winter. The introduction of hardy grasses and forage plants will revolutionize the stock-raising industry. Winter turf oats and hairy vetch grown together form a good winter pasture. A

field sown in September will furnish pasture from January to May. If the pasturing is discontinued April 1, a crop of hay may be cut in May, or seed may be harvested in June. Rape sown in October or November would furnish an excellent flesh-producing pasture during the winter. On the Norfolk sandy loam type these crops should do well. A field of alfalfa was observed near St. Augustine on soil resembling the Norfolk sand about Gainesville. It was making a vigorous growth, and furnishing pasture for a small herd of cows. Alfalfa should be sown in the fall and not pastured the first year, or until it secures a good stand.

The hogs raised receive no more attention than the cattle, but are allowed to run at large and care for themselves. They are of inferior grade and always in poor condition. Sheep and goats are also raised, though not extensively. As they are of a more roving disposition and closer grazers than cattle they withstand the winters and the scant pasture better. Their condition, however, is in need of careful attention, for what is now yielding but a small per cent on money invested could, by careful management, be made to return handsome profits.

During the past few years the turpentine industry has been extending rapidly, principally as a result of the introduction of the cup and gutter system promoted by the Bureau of Forestry during the last three years, which makes it possible to turpentine timber already boxed to the fullest extent. A considerable area of pine timber is, however, still worked under the box system, but particularly in out of the way sections and by the least progressive operators. A large percentage of those using boxes would gladly apply the cup and gutter system, but at the present time it is not possible to secure the necessary equipment.

A chemical plant, located at Gainesville, extracts turpentine and other products from the pine wood by a new process, by means of which the trunks of trees and the stumps can be utilized. The lumbermen are fast cutting away the timber, and practically no attention is paid to the young trees now coming on. In a few years the forests will be gone, and then the work of reforesting must, of necessity, be considered.

New York, Philadelphia, Baltimore, and Washington furnish a ready market for all the vegetables grown within the area. Agents of the commission houses are kept in the field during the growing season, to deal directly with the farmer. The vegetables are consigned to the commission men, who sell them on a commission of 10 per cent. In order that the vegetables may be put on the market in a fresh condition, they must be crated carefully and transported safely and quickly. A fancy price must be received if the grower is

to make a profit on his crop, for the express rates are high, and the commission, plus the first cost of production, makes the total cost very high. Gainesville furnishes a market for a small amount of farm produce, and is also a distributing center for seed and farm implements. It is also the center of the Sea Island cotton industry, which product is controlled by one firm at Gainesville.

The transportation facilities of the area are equal to the demands of production. The Cedar Keys division of the Seaboard Air Line and a branch of the Atlantic Coast Line pass through the area and intersect at Gainesville. The Gainesville and Gulf Railway, a short line of but 69 miles, also passes through Gainesville, and reaches the richest trucking districts in the area. Rock-surfaced roads are built out from Gainesville and Micanopy, and between Flemington and Williston, a total distance of 35 miles. The rock used is the limestone found throughout the area. Owing to the light character of the soils, the dirt roads are sandy. The county roads are kept in repair by a county road commissioner, who keeps a gang of men continually at work repairing and grading. The private roads are numerous, and generally in good condition, owing to the fact that they are not extensively used.

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SOIL MAP

FLORIDA
GAINESVILLE SHEET

Soils surveyed by
Thomas D. Rice and W. J. Geib
1904.

BASE MAP FROM
U.S. GEOLOGICAL SURVEY SHEETS

Scale 1/62500
Contour Interval 10 feet
Datum is mean sea level

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